CLAIM AMENDMENTS

1. (Previously Presented) An apparatus for acoustically analyzing a fluid comprising:

a chamber for holding the fluid;

a transmitter positioned within the chamber for transmitting an acoustic signal through the fluid;

a reflector positioned within the fluid for reflecting the acoustic signal; and

a receiver positioned within the chamber for detecting a reflection of the acoustic signal;

wherein said apparatus is incorporated in a downhole sampling device.

2. (Original) The apparatus of Claim 1, wherein the chamber comprises a sealed first end, a piston slidably disposed within a second end of the chamber and a conduit for introducing the fluid into the chamber.

3. (Original) The apparatus of Claim 2, further comprising a servomotor for driving the piston and varying at least one of a pressure and a temperature of the fluid within the chamber.

4. (Original) The apparatus of Claim 1, wherein the chamber is thermally insulated to substantially maintain at least one of a pressure and temperature of the fluid within the chamber.

5. (Original) The apparatus of Claim 1, wherein the transmitter and the receiver are embodied in a single piezoelectric transducer.

6. (Currently Amended) The apparatus of Claim 5, further comprising a ~~static~~ piston mounted within the chamber near the first end for supporting the transducer within the fluid.

7. (Original) The apparatus of Claim 6, further comprising a square-wave pulsar/receiver connected to the transducer for driving the transducer and processing the reflection of the acoustic signal.

8. (Original) The apparatus of Claim 7, further comprising an oscilloscope connected to the square-wave pulsar/receiver for imaging the reflection of the acoustic signal.

9. (Original) The apparatus of Claim 8, wherein the reflector is a disc positioned opposite the transducer relative to the piston.

10. (Original) The apparatus of Claim 8, wherein the reflector is a ring positioned opposite the transducer relative to the piston.

11. (Original) The apparatus of Claim 1, further comprising a first electromagnetic coil and a second electromagnetic coil, the first electromagnetic coil and the second electromagnetic coil being independently driven for manipulating the reflector.

12. (Original) The apparatus of Claim 11, wherein the reflector comprises at least one of a first reflective surface and a second reflective surface for analyzing a property of the fluid comprising at least one of velocity, volume, density, compressibility and viscosity.

13. (Original) The apparatus of Claim 12, wherein the reflector comprises a material having a substantially low coefficient of thermal expansion and a high bulk modulus for mitigating any variation in a distance between the first reflective surface and the second reflective surface as the material is subjected to a predetermined temperature and pressure within the chamber.

14. (Currently Amended) An apparatus for acoustically analyzing a fluid comprising:

a chamber for holding the fluid;

a transducer coupled with the chamber for transmitting an acoustic signal through the fluid and detecting a reflection of the acoustic signal;

a reflector positioned within the fluid for reflecting the acoustic signal; and

a ~~static~~ first piston mounted within the chamber for supporting the transducer within the fluid.

15. (Original) The apparatus of Claim 14, wherein the chamber comprises a sealed first end, a second piston slidably disposed within a second end of the chamber and a conduit for introducing the fluid into the chamber.

16. (Canceled)

17. (Original) The apparatus of Claim 14, further comprising a first electromagnetic coil and a second electromagnetic coil, the first electromagnetic coil and second electromagnetic coil being independently driven for manipulating the reflector.

18. (Original) The apparatus of Claim 17, wherein the reflector comprises at least one of a first reflective surface and a second reflective surface for analyzing a property of the fluid comprising at least one of velocity, volume, density, compressibility, and viscosity.

19. (Original) The apparatus of Claim 18, wherein the reflector comprises a material having a substantially low coefficient of thermal expansion and a high bulk modulus for mitigating any variation in a distance between the first reflective surface and the second reflective surface as the material is subjected to a predetermined temperature and pressure within the chamber.

20. (Previously Presented) A method for acoustically analyzing a fluid in a chamber using a transmitter, a substantially stationary reflector positioned within the fluid inside the chamber, and a receiver, all incorporated in a downhole sampling device, the method comprising the steps of:

drawing a formation fluid from an earth formation; and

under in-situ conditions:

transmitting an acoustic signal from the transmitter through the fluid; and

detecting reflections of the acoustic signal from the reflector at the receiver.

21. (Original) The method of Claim 20, wherein the transmitter and the receiver are embodied in a single piezoelectric transducer.

22. (Original) The method of Claim 21, wherein the transducer is supported within the fluid at one end of the chamber.

23. (Original) The method of Claim 22, wherein the reflector is a disc positioned opposite the transducer relative to another end of the chamber.

24. (Original) The method of Claim 22, wherein the reflector is a ring positioned opposite the transducer relative to another end of the chamber.

25. (Original) The method of Claim 20, further comprising the step of determining a property of the fluid comprising at least one of velocity, volume, density, compressibility, and viscosity.

26. (Original) The method of Claim 25, wherein the velocity of the acoustic signal through the fluid at a predetermined temperature and pressure ($Vel._{T,P}$) is determined by:

$Vel._{T,P} = D_{T,P} \div .5 \times (T_2 - T_1)$.

27. (Previously Presented) The method of Claim 26, wherein the volume of the fluid at the predetermined temperature and pressure ($Vol._{T,P}$) is determined by:

$Vol._{T,P} = (.5 \times T_3 \times Vel._{T,P}) \times (\pi \times R^2)$.

28. (Previously Presetented) The method of Claim 27, wherein the density of the fluid at the predetermined temperature and pressure ($Den._{T,P}$) is determined by:

$Den._{T,P} = M \div Vol._{T,P}$.

29. (Previously Presented) The method of Claim 26, wherein the predetermined temperature is about 400° F and the predetermined pressure is about 25,000 psi.

30. (Original) The method of Claim 26, further comprising the step of calibrating the reflector based upon a known coefficient of thermal expansion for a material comprising the reflector.

31 - 33. (Canceled)

34. (Previously Presented) The method of Claim 20, wherein the reflector is substantially stationary.

35. (Previously Presented) The method of Claim 20, wherein the reflector is moveably positioned.

36. (Previously Presented) The method of Claim 25, wherein the reflector is moveably positioned.

37. (Previously Presented) The apparatus of Claim 1, wherein the downhole sampling device forms part of a wireline fluid sampling tool.

38. (Previously Presented) The apparatus of Claim 1, wherein the reflector is moveably positioned.

39. (Previously Presented) The apparatus of Claim 11, wherein the reflector is moveably positioned.

40. (Previously Presented) The apparatus of Claim 1, wherein the reflector comprises a first reflective surface and a second reflective surface, defining a first path of movement of the acoustic signal through the fluid as the acoustic signal leaves the transmitter and is reflected off of the first reflective surface to the receiver, and defining a second path of movement of the acoustic signal through the fluid as the acoustic signal leaves the transmitter and is reflected off of the second reflective surface to the receiver, whereby the second path through the fluid is longer than the first path through the fluid.

41. (Previously Presented) The apparatus of Claim 14, wherein the reflector is moveably positioned.

42. (Previously Presented) The apparatus of Claim 17, wherein the reflector is moveably positioned.

43. (Previously Presented) The apparatus of Claim 14, wherein the transducer is embodied in a single piezoelectric transducer.

44. (Previously Presented) The apparatus of Claim 14, further comprising a square-wave pulsar/receiver connected to the transducer for driving the transducer and processing the reflection of the acoustic signal.

45. (Previously Presented) The apparatus of Claim 44, further comprising an oscilloscope connected to the square-wave pulsar/receiver for imaging the reflection of the acoustic signal.

46. (Previously Presented) The apparatus of Claim 45, wherein the reflector is a disc positioned opposite the transducer relative to the piston.

47. (Previously Presented) The apparatus of Claim 45, wherein the reflector is a ring positioned opposite the transducer relative to the piston.

48. (Previously Presented) The apparatus of Claim 14, wherein the reflector comprises a first reflective surface and a second reflective surface, defining a first path of movement of the acoustic signal through the fluid as the acoustic signal leaves the transducer and is

reflected off of the first reflective surface and returns to the transducer, and defining a second path of movement of the acoustic signal through the fluid as the acoustic signal leaves the transducer and is reflected off of the second reflective surface and returns to the transducer, whereby the second path through the fluid is longer than the first path through the fluid.

49. (Previously Presented) An apparatus for acoustically analyzing a fluid comprising:

a chamber for holding the fluid;

a transmitter positioned within the chamber for transmitting an acoustic signal through the fluid;

a reflector positioned within the fluid for reflecting the acoustic signal; and

a receiver positioned within the chamber for detecting a reflection of the acoustic signal,

wherein the reflector comprises at least one of a first reflective surface and a second reflective surface for analyzing a property of the fluid comprising at least one of velocity, volume, density, compressibility and viscosity, and wherein the reflector comprises a material having a substantially low coefficient of thermal expansion and a high bulk modulus for mitigating any variation in a distance between the first reflective surface and the second reflective surface as the material is subjected to a predetermined temperature and pressure within the chamber.

50. (Previously Presented) The apparatus of Claim 49, wherein the reflector is moveably positioned.

51. (Previously Presented) The apparatus of Claim 50, further comprising a first electromagnetic coil and a second electromagnetic coil, the first electromagnetic coil and the second electromagnetic coil being independently driven for manipulating the reflector.

52. (Previously Presented) An apparatus for acoustically analyzing a fluid comprising:

a chamber for holding the fluid;

a transmitter positioned within the chamber for transmitting an acoustic signal through the fluid;

a reflector positioned within the fluid for reflecting the acoustic signal; and

a receiver positioned within the chamber for detecting a reflection of the acoustic signal;

wherein the reflector comprises a first reflective surface and a second reflective surface, defining a first path of movement of the acoustic signal through the fluid as the acoustic

signal leaves the transmitter and is reflected off of the first reflective surface to the receiver, and defining a second path of movement of the acoustic signal through the fluid as the acoustic signal leaves the transmitter and is reflected off of the second reflective surface to the receiver, whereby the second path through the fluid is longer than the first path through the fluid.

53. (Previously Presented) The apparatus of Claim 52, wherein the reflector is moveably positioned.

54. (Previously Presented) The apparatus of Claim 53, wherein the transmitter and the receiver are embodied in a single transducer.

55. (Previously Presented) A method for acoustically analyzing a fluid in a chamber using a transmitter, a reflector positioned within the fluid inside the chamber, and a receiver, the method comprising the steps of:

transmitting an acoustic signal from the transmitter through the fluid;

detecting reflections of the acoustic signal from the reflector at the receiver; and

determining a property of the fluid comprising at least one of velocity, volume, density, compressibility, and viscosity, wherein the velocity of the acoustic signal through the fluid at a predetermined temperature and pressure ($Vel._{T,P}$) is determined by:

$Vel._{T,P} = D_{T,P} \div .5 \times (T_2 - T_1)$.

56. (Previously Presented) The method of Claim 55, wherein the volume of the fluid at the predetermined temperature and pressure ($Vol._{T,P}$) is determined by:

$Vol._{T,P} = (.5 \times T_3 \times Vel._{T,P}) \times (\pi \times R^2)$.

57. (Previously Presented) The method of Claim 56, wherein the density of the fluid at the predetermined temperature and pressure ($Den._{T,P}$) is determined by:

$Den._{T,P} = M \div Vol._{T,P}$.

58. (Previously Presented) The method of Claim 55, wherein the predetermined temperature is about 400° F and the predetermined pressure is about 25,000 psi.

59. (Previously Presented) The method of Claim 55, further comprising the step of calibrating the reflector based upon a known coefficient of thermal expansion for a material comprising the reflector.

60. (Previously Presented) The method of Claim 55, wherein the transmitter and the receiver are embodied in a transducer.

61. (Previously Presented) The method of Claim 55, wherein the transmitter and the receiver are embodied in a single piezoelectric transducer.

62. (Previously Presented) The method of Claim 55, wherein the reflector is moveably positioned.

63. (Previously Presented) The method of Claim 62, further comprising the step of manipulating the reflector by independently driving a first electromagnetic coil and a second electromagnetic coil.

64. (New) The apparatus of Claim 6, wherein the piston is a static piston.

65. (New) The apparatus of Claim 14, wherein the first piston is a static piston.

66. (New) An apparatus for acoustically analyzing a fluid comprising:

a chamber for holding the fluid;

a transmitter positioned within the chamber for transmitting an acoustic signal through the fluid;

a reflector positioned within the fluid for reflecting the acoustic signal; and

a receiver positioned within the chamber for detecting a reflection of the acoustic signal;

wherein the chamber comprises a sealed first end, and a piston slidably disposed within a second end of the chamber and a motor coupled to the piston for driving the piston and varying at least one of a pressure and a temperature of the fluid within the chamber.

67. (New) The apparatus of claim 66, further comprising a conduit for introducing the fluid into the chamber.

68. (New) The apparatus of Claim 67, wherein the motor is a servomotor.

69. (New) The apparatus of Claim 66, wherein the chamber is thermally insulated to substantially maintain at least one of a pressure and temperature of the fluid within the chamber.

70. (New) The apparatus of Claim 66, wherein the transmitter and the receiver are embodied in a transducer.

71. (New) The apparatus of Claim 70, further comprising a square-wave pulsar/receiver connected to the transducer for driving the transducer and processing the reflection of the acoustic signal.

72. (New) The apparatus of Claim 66, wherein the transmitter and the receiver are embodied in a single piezoelectric transducer.

73. (New) The apparatus of Claim 66, further comprising a static piston mounted within the chamber near the first end.

74. (New) The apparatus of Claim 73, wherein the transmitter and the receiver are embodied in a single piezoelectric transducer that is supported on the static piston.

75. (New) The apparatus of Claim 66, herein the transmitter and the receiver are embodied in a single piezoelectric transducer that is supported on the slidably disposed piston.